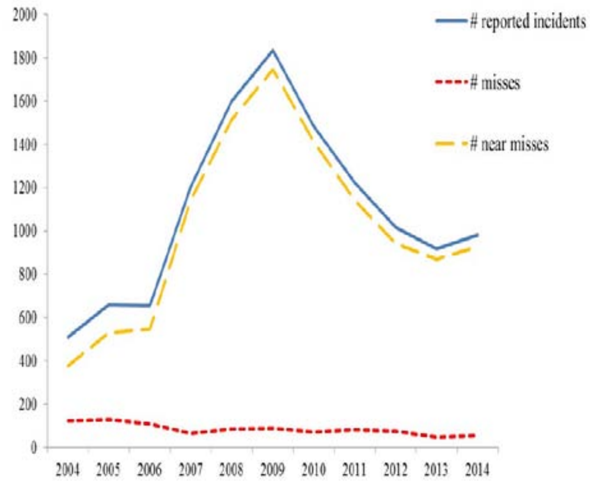
measures four overall safety outcomes and ten dimensions of safety climate on a five-point scale, and a new developed factorial survey which measured the intentions for safety behaviour. Surveys were distributed three times in a three year period. In addition, the HSOPSC and the data from the IRS were used to evaluate the sustainability of results in 2015. Averages, chi-square, logistical and multi-level regression were used for analysis.

Results: Although the workshops detected no changes in safety culture between 2011 and 2013, the HSOPSC showed improvements on six out of twelve safety culture dimensions. In 2012, staffing, teamwork across units and handoffs & transitions presented more positive scores than in 2010 (Table 1). Improvements sustained and in 2013 the dimensions feedback & communication about error, experienced management support for safety and the overall perception of patient safety improved. All improvements had sustained until 2015 and teamwork across units improved further. Based on the results from the factorial survey on intentions for safety behavior, the intention to report incidents not reaching patient-level (near misses) decreased from 2010 to 2013 in accordance with the decreasing number of reports in the IRS. However, the intention towards taking action to prevent future incidents (structural improvement), strongly improved in 2013 (ß: 1.19 with p: 0.01), especially for the near misses. From 2004 to 2009, the number of reported incidents increased from 510 to 1835 reports on yearly basis (Figure 1). However, the number of reported incidents that reached patient-level (misses) decreased with 27% from 2004 (N=122) to 2009 (N=89). From 2009 the number of reported near misses decreased with 50% from 1746 to 870 in 2013. However, the number of reported misses decreased with about 40% (89 in 2009 to 48 in 2013/ 55 in 2014).The interviewed employees experienced a sustained safety awareness, improved quality of reports and a strong increase in creating structural improvements. Due to improvements in equipment and increased problem solving, the actual number of incidents could have decreased.

Dimensions of HSOPSC	T1 (2010) N=54	T2 (2012) N=53	T3 (2013) N=51	T4 (2015) N=49	p T2–T1	p T3–T2	p T3–T1	p T4–T3
D1: Supervisor/manager expectations and actions promoting PS	64	68	74	67	0.379	0.317	**0.050**	0.314
4.1. My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures.	65	57	71	57	0.250	0.106	0.805	0.148
4.2. My supervisor/manager seriously considers staff suggestions for improving	69	77	78	67	0.152	0.780	0.350	0.313
4.3.[R] Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts.	63	72	75	71	0.452	0.614	0.322	0.665
4.4.[R] My supervisor/manager overlooks patient safety problems that happen over	59	66	71	74	0.769	0.135	0.071	0.524
D2: Organizational learning/ continuous improvement	64	62	70	69	0.687	0.308	0.304	0.736
3.6. We are actively doing things to improve patient safety.	95	85	96	96	0.259	0.133	0.866	0.999
3.9. Mistakes have led to positive changes here.	76	73	84	78	0.296	0.064	0.488	0.449
3.13. After we make changes to improve patient safety, we evaluate their	52	28	29	33	0.434	0.766	0.144	0.429
D3: Teamwork within units	70	71	77	82	0.930	0.162	0.104	0.155
3.1. People support one another in this unit.	93	89	92	98	0.427	0.809	0.761	0.362
3.3. When a lot of work needs to be done quickly, we work together as a team to get the work done.	78	70	80	88	0.638	0.181	0.387	0.097
3.4. In this unit, people treat each other with respect.	80	83	90	96	0.367	0.241	0.341	0.455
3.11. When one area in this unit gets really busy, others help out.	32	42	46	47	0.415	0.128	0.148	0.874
D4: Communication openness	72	70	78	76	0.724	0.193	0.073	0.778
5.2. Staff will freely speak up if they see something that may negatively affect	94	85	92	94	0.104	0.247	0.639	0.736
5.4. Staff feel free to question the decisions or actions of those with more	50	43	61	57	0.556	0.076	0.062	0.668
5.6.[R] Staff are afraid to ask questions when something does not seem right.	72	83	80	78	0.221	0.586	0.539	0.567
D5: Feedback and communication about error	60	62	76	78	0.661	**0.033**	**0.009**	0.714
5.1. We are given feedback about changes put into place based on event	48	47	69	82	0.940	0.067	0.094	0.269
5.3. We are informed about errors that happen in this unit.	65	68	71	71	0.516	0.781	0.747	0.602
5.5. In this unit, we dicuss ways to prevent errors from happening again.	67	72	88	82	0.634	0.077	**0.028**	0.463
D6: Non-punitive response to error	87	79	78	84	**0.045**	0.978	0.076	0.258
3.8.[R] Staff feel like their mistakes are held against them.	85	81	80	86	0.593	0.858	0.714	0.694
3.12.[R] When an event is reported, it feels like the person is being written up, not	95	85	92	85	0.140	0.512	0.494	0.232
3.16.[R] Staff worry that mistakes they make are kept in their personnel file.	82	69	61	82	0.180	0.559	**0.023**	0.071
D7: Staffing	36	44	54	49	0.101	0.12	**<0.001**	0.424
3.2. We have enough staff to handle the workload.	17	45	59	39	**<0.001**	0.323	**<0.001**	0.129
3.5.[R] Staff in this unit work longer hours than is best for patient care.	43	51	55	49	0.082	0.610	0.250	0.833
3.7.[R] We use more agency/temporary staff than is best for patient care.	67	47	63	76	**0.016**	0.122	0.654	0.370
3.14.[R] We work in "crisis mode" trying to do too much, too quickly.	19	32	39	33	0.257	0.644	0.062	0.493
D8: Management support for PS	41	42	64	60	0.835	**0.001**	**<0.001**	0.656
8.1. Hospital management provides a work climate that promotes patient safety.	48	51	73	61	0.341	**0.026**	**0.003**	0.334
8.8. The actions of hospital management show that patient safety is a top priority.	40	33	58	54	0.272	**0.032**	**0.049**	0.758
8.9.[R] Hospital management seems interested in patient safety only after an adverse event happens.	33	42	61	67	0.100	0.076	**0.016**	0.213
D9: Teamwork across units	34	51	52	73	**<0.001**	0.015'	**<0.001**	**0.001**
8.4. There is good cooperation among hospital units that need to work together.	24	47	45	69	**0.043**	0.313	**0.014**	**0.046**
8.10. Hospital units work well together to provide the best care for patients.	43	60	71	82	0.177	**0.045**	**0.001**	0.079
8.2.[R] Hospital units do not coordinate well with each other.	7	15	16	57	**0.032**	0.411	**0.001**	**<0.001**
8.6.[R] It is often unpleasant to work with staff from other hospital units.	61	79	76	86	0.116	0.144	**0.023**	0.239
D10: Handoffs and transitions	32	42	50	61	0.051	0.250	**<0.001**	0.142
8.3.[R] Things "fall between the cracks" when transferring patients from one unit to	13	23	31	51	0.050	0.393	**0.001**	0.129
8.5.[R] Important patient care information is often lost during shift changes.	39	53	51	59	0.210	0.826	0.427	0.611
8.7.[R] Problems often occur in the exchange of information across hospital units.	20	32	47	63	**0.002**	0.295	**<0.001**	0.240
8.11.[R] Shift cahnges are problematic for patients in this hospital.	57	59	69	69	0.389	0.214	0.490	0.868
O1: Overall perceptions of PS	57	55	66	64	0.641	**0.033**	**0.018**	0.717
3.15. Patient safety is never sacrified to get more work done.	30	27	34	31	**0.048**	0.646	0.137	0.959
3.18. Our procedures and systems are good at preventing errors from happening.	52	57	69	74	0.399	**0.011**	**0.046**	0.846
3.10.[R] It is just by chance that more serious mistakes don't happen around here.	77	64	78	75	0.313	0.282	0.825	0.933
3.17.[R] We have patient safety problems in this unit.	68	71	82	74	0.951	0.202	0.118	0.131
O2: Frequency of reported events	65	55	50	65	**0.048**	0.136	**0.016**	**0.027**
6.1. When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?	61	42	43	59	0.063	0.244	0.181	0.060
6.2. When a mistake is made, but has no potential to harm the patient, how often is this reported?	52	43	29	45	**0.027**	0.593	**0.036**	0.258
6.3. When a mistake is made that could harm the patient, but does not, how often is this reported?	83	88	77	90	0.773	0.279	0.624	0.203

Positive scores: negative formulations were recoded
p-values<0.05 are bold

Figure 1. Results from the Incident Reporting System for 2004 until 2014.



Conclusion: Due to increased problem solving and improvements in equipment, the number of incidents decreased until 2013. Although the intention to report incidents not reaching patient-level decreased, employees experienced sustained safety awareness and an increased intention to structurally improve. The patient safety culture improved in 2013 due to the lean activities combined with an organizational restructure, and actual patient safety outcomes might have improved as well. Results from 2015 proved the sustainability of the realized improvements. We conclude that lean management can help to improve the patient safety culture, but it's success depends greatly on how lean is implemented. In addition to the cultural aspects, structural elements and clinical process improvements should be addressed to create sustainable quality/safety improvements. Measurement of effect is an important foundation for continuous improvement. As patient safety culture is a complex phenomena, quantitative and qualitative measures should be combined to increase understanding in the actual effects. A sufficient level of detail in measures should be reported to not loose the opportunities for improvement.

SP-0602

The impact of demographics trend, cancer incidence and cancer prevalence for planning numbers of treatment units in Austria

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Purpose: There are around 38.000 new cancer cases in Austria per year. To generate an optimal patient-centered cancer care are clear formal structures in Austria how to plan the resources in health care. Based on a constitutional law exist a regulation between the national government, the district governments and the social insurances as third party based on which also the resources for radiotherapy are planned. The major method to calculate resources for radiotherapy is to refer treatment units to the population number, which has been formulated according to national guidelines for Austria. This method can also take into account demographics trends. This investigation addresses the additional impact of cancer incidence and prevalence estimates on such calculation models for population based number of treatment units (LIN).

Methods and materials: According to laws and national / regional guidelines (aim: 1 LIN for 100.000-140.000 inhabitants (Austrian Structure plan for Healthcare (ÖSG)) the recommended number of treatments units in radiotherapy were calculated for Austria and the city of Vienna for 2015 (population of 8.6 mill/1.8 mill) and for 2020 and 2030 taking into account expected demographic development. Around 60% of the 38.000 new cancer patient will have a treatment in a radiotherapy department. Based on the figures of the Austrian Cancer registrations the cancer prevalence will increase dramatically in the near future based on the demographic trend, general increased expectation of life in combination with the expectations of higher survival rate of cancer patients. In addition, prognosis for cancer prevalence and cancer incidence were used to calculate the needed number of LIN for the year 2015, 2020 and 2030 for Austria and Vienna.

Results: There is a need for minimum 61 LIN and maximum 86 LIN and present which implies a discrepancy of 18 LIN for the whole country (actual 43 LIN) for 2015. Based on the prognosis for cancer incidence a discrepancy of 14 LIN for Austria (aim 57 LIN) exists for 2015. The cancer prevalence prognosis shows a need for 68 LIN, which is a discrepancy of 25 LIN for the year 2015. For the city of Vienna, the actual situation (12 LIN) seems appropriate, as the discrepancy for 2015 is only 1 LIN. There is one important extra factor for Vienna: about 20% of all treated cancer patient come from Austrian neighbour districts, therefore there is a growing waiting list in Vienna. The entire prognosis until 2030 are general worse, because the results shows 2.01 mill inhabitants and around 8900 new cancer cases gives a need of 16 LIN for Vienna.

Conclusion: There is a minimum discrepancy of 18 LIN for the whole country for 2015. One important factor for precise planning the resources in radiotherapy is the cancer prevalence. Based on the prognosis model with the cancer prevalence is an actual need of 25 LIN for whole Austria and one more in Vienna. To fulfil the constitutional law obligations, the government should immediately start to close the gap of minimum 18 LIN for the whole country. Austria will have in 15 years a shortage of 40 LIN (aim 73 LIN) and this will have a negative impact on waiting time and outcomes of the treatments. Never less in these calculations is not the included the different complexity of treatments in radiotherapy which need different recourses of time, staffing and equipment. A further project should implement these factors to get a much more tailored planning for the formal recommended radiotherapy resources in Austria. .

Symposium: Combining radiotherapy with molecular targeted agents: learning from successes and failures

SP-0603
Interaction of radiotherapy with molecular targeting agents

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Despite the well established role of radiation in the treatment of solid tumor malignancies, and the rapidly expanding cadre of promising molecular targeting agents in oncology, the systematic investigation of radiation combined with molecular agents remains in an early dawn period. The increased precision of modern day radiation delivery to tumor targets with diminished dose exposure to normal tissues lends itself very favorably to combination with systemic therapies, particularly those tailored to specific molecular tumor targets. The complementary strengths of highly conformal radiation with molecular targeting agents affords a powerful opportunity to advance precision cancer medicine to a new level of impact for the future.
In this presentation, we will review the rationale for combining radiation with molecular targeting agents and consider opportunities for systematic study in both the preclinical and clinical trials setting. Several major clinical trials that examine this combination will be presented and discussed to highlight current findings and future opportunities. Strategies to expand the investigation of radiation/molecular target combination studies will be previewed. In both the curative and palliative oncology setting, it is possible that some of the most compelling opportunities for improvement in cancer patient outcomes for the future may derive from combinations of radiation with molecular targeting agents.

SP-0604
Challenges combining radiotherapy with immunotherapy

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Both preclinical studies and case reports have described synergistic interactions between local radiation (RT) and different types of cancer immunotherapy, demonstrating the potential for the combination to enhance locoregional efficacy and, by inducing an effective immune response reflect in systemic control. The latter effect, defined as "abscopal" is particularly relevant, since it has re-positioned classical radiotherapy into a treatment modality with systemic effects (1, 2). Our group described a role for RT in enhancing T cell activation and proliferation via antigen cross-presentation in the draining lymph node when combined with a diverse array of immune strategy, including enhancers of the priming phase (Flt-3L, GM-CSF, TLR agonists) or the effector phase (blocking CTLA4, PD-1, or TGF-beta) (3-8). Specifically, when combined with anti-CTLA-4 we demonstrated mechanisms underlying the abscopal effect, including enhanced T cell homing through release of CXCL16 and enhancement of the immunological synapse by release of RAE, the ligand for NKG2D receptor (7,8). We further demonstrated the clonal diversity of T cell immune responses induced by RT alone and RT combined with ipilimumab in patients with metastatic non small cell lung cancer refractory to other treatments, and are currently working at detecting the specific antigens responsible for the immune response to the combination (unpublished data).
However, many challenges remain to best optimize radiation in the context of cancer immunotherapy, both in terms of the choice of dose and fractionation when radiation is combined with immunotherapy as well as how to best block the immunosuppressive effects that accompany the immunogenic properties of radiation.
While we have demonstrated that when combined with anti CTLA-4 radiation best work when hypo-fractionated, it remains unclear whether ablative doses are necessary to sustain this effect (9). Similarly, when radiotherapy is combined with both CTLA-4 and PD- blockade the optimal scheduling remain unknown. Because of the immune-privilege status of established tumors, it is likely for multiple strategies to be necessary to subvert this condition (10). Ideally a rseries of well orchestrated interventions should result in release of neo-antigens, increased permeability of the tumor to enhance access to antigen presenting cells and increased cross presentation (potentially with the addition of TLR agonists). The ensuing effector phase requires the availability of a sufficient number of T lymphocytes, a variable that can be assessed by measuring in the peripheral blood the ratio between neutrophils and lymphocytes (11). Blockade of immune checkpoints is also required to develop and sustain a robust effector response. The concurrent interplay of macrophages is crucial for each of the steps described (12). While preclinical evidence for the therapeutic advantage of reverting macrophage polarization from M2 to M1 is emerging, how to optimally combine radiotherapy remains elusive. Experiments of low dose radiation inducing M1 polarization and recovering response to immune checkpoint blockade are being translated to the clinic (13). Strategies to overcome the immunosuppressive effects of RT have also evolved from preclinical to clinical setting. For instance to overcome RT-induced activation of TGFbeta, the need for additional PD-1 blockade has emerged, and it warrants clinical testing (6). A general barrier to advance the field consists of the complexity of testing multiple immunotherapy agents, often provided by different pharmaceutical companies. While radiation is a standard modality, with well-established, organ-specific acute and longterm toxicities, its use in combination with each immunotherapy agent obeys standard clinical trials safety and feasibility rules, and the pace of clinical testing. To this